

REMARKS

In the Official Action mailed July 12, 2004, the Examiner objected to the claims 5, 6, 19, 20 and 22 and rejected claims 1-3, 5-17 and 19-22, which are pending in the application. While claims 5, 6, 19, 20 and 22 are currently amended, no claims are canceled or added. Accordingly, claims 1-3, 5-17 and 19-22 remain pending in the application.

In the Official Action, the Examiner objected to claims 5, 6, 19, 20 and 22 as having certain informalities. Claims 2 and 16 were rejected under 35 U.S.C. §101 as claiming the same invention as claims 8 and 18 of prior U.S. Patent No. 6,684,177 to Mishra et al. (“the ‘177 patent”), which is the parent of the present application. Also, claims 1, 3, 5-7, 13, 15, 17, 19, 21 and 22 were rejected under 35 U.S.C. § 103(a) as being rendered obvious by U.S. Patent No. 6,397,166 to Leung et al. (“the Leung reference”) in view of U.S. Patent No. 6,115,708 to Fayyad et al. (“the Fayyad reference”). Claims 8 and 11 were rejected under 35 U.S.C. § 103(a) as being rendered obvious by Leung in view of Fayyad and U.S. Patent Application No. 2002/0052692 to Fahy (“the Fahy reference”). Further, claims 9, 10 and 12 were rejected under 35 U.S.C. § 103(a) as being rendered obvious by Leung in view of Fayyad and U.S. Patent No. 6,236,978 to Tuzhilin (“the Tuzhilin reference”). Finally, claims 14 and 20 were rejected under 35 U.S.C. § 103(a) as being rendered obvious by Leung in view of Fayyad and U.S. Patent No. 6,003,036 to Martin (“the Martin reference”). Each of these objections and rejections is addressed in detail below.

Objections to the Claims

In the Official Action, the Examiner objected to the claims 5, 6, 19, 20 and 22 because of certain informalities regarding claim dependency. Accordingly, the Applicant has amended the claims 5 and 6 to depend from independent claim 1. Similarly, claims 19 and 20

have been amended to depend from independent claim 15. Claims 20 and 22 have also been amended to correct typographical errors in the respective claims. As these amendments are being made for clerical errors, the Applicant respectfully submits that no new subject matter is added by the present amendment to the claims. Thus, the Applicant submits that the amendments to the claims are sufficient to overcome the Examiner's objections. Accordingly, the Applicant respectfully requests withdrawal of the Examiner's objections.

Double Patenting Rejection

In the Official Action, the Examiner rejected claims 2 and 16 under 35 U.S.C. §101 as claiming the same invention as claims 8 and 18 of the '177 patent. Specifically, the Examiner stated:

Claims 2 and 16 are rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 8 and 18 of prior U.S. Patent 6,684,177. This is a double patenting rejection

Claims 2 and 16 of the present application contain the added text "prior to clustering" for the same step also found in claims 8 and 18 of the '177 patent. While this text is not found in claims 8 and 18 of the '177 patent, the fact that the step is recited immediately before the clustering step in claims 8 and 18 suggests that the merging should happen before the clustering. Further, the original claims 2 and 16 in the application for the '177 patent are identical to claims 2 and 16 in the present application and were indicated to contain allowable material. Since those claims were combined with independent claims to form the patent claims 8 and 18, the implication is that the steps are executed in the order that they appear in the claims.

Official Action, pages 2-3.

Because 35 U.S.C. § 101 prevents two patents from issuing on the same invention, a determination of whether statutory double patenting exists under section 101 is found by asking whether the same invention is being claimed twice. The meaning of "same invention"

is *identical subject matter*. *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1984); *In re Vogel*, 422 F.2d 438, 164 U.S. P.Q. 619 (C.C.P.A. 1970) and *In re Ockert*, 245F.2d 467, 114 U.S.P.Q. 330 (C.C.P.A. 1957). A reliable test for determining whether double patenting exists under section 101 is to ask whether the claim in the application could be literally infringed without literally infringing a corresponding claim in the patent. *Vogel*. In other words, the test for double patenting is whether an embodiment of the invention that falls within the scope of one claim but not the other. If such an embodiment exists, *identical* subject matter is *not* defined by both claims and statutory double patenting would not exist. M.P.E.P. § 804(II)(A).

In the rejection, the Examiner asserted that the only difference between claims 2 and 16 of the present application and the claims 8 and 18 of the '177 patent is that the claims 2 and 16 of the present application include the phrase "prior to clustering" in relation to the merging of the weighted centers. Despite this added text, the Examiner stated that because merging is recited immediately before the clustering step in claims 8 and 18 of the '177 patent, it suggests that the merging should happen before the clustering. The Applicant respectfully traverses this assertion and notes that the claims 2 and 16 of the present application recite subject matter absent from the claims of the '177 patent. As a result, systems could be envisioned that infringe claims 8 and 18 of the '177 patent but not claims 2 and 16 of the present application. In view of the binding precedent of *Vogel*, therefore, there is no double patenting.

For example, the Examiner will note that claims 2 and 16 of the present application recite "prior to clustering." The Examiner will further note that claims 8 and 18 of the '177 patent do not recite "prior to clustering." Accordingly, a method or article that merges the weighted centers into a single dataset D during or after clustering would be literally

encompassed by the claims 8 and 18 of the '177 patent. However, such a method or article would *not* necessarily come within the scope of claims 2 and 16 of the present application. Accordingly, the Applicant respectfully submits that claims 8 and 18 of the '177 patent cannot serve as a basis for a double patenting rejection under 35 U.S.C. § 101 with regard to claims 2 and 16 of the present application. The Applicant therefore respectfully requests withdrawal of the Examiner's rejection and allowance of claims 2 and 16.

First Rejection Under 35 U.S.C. § 103

As set forth above, the Examiner rejected claims 1, 3, 5-7, 13, 15, 17, 19, 21 and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Leung in view of Fayyad. Specifically, the Examiner stated:

With regard to determining a set of intermediate centers, as shown in claims 1, 15, 21 and 22, Leung et al. teach determining cluster centers (col. 6, lines 19-40). With regard to assigning each data point to the nearest center, as shown in claims 1, 15, 21 and 22, Leung et al. teach using a similarity measure to determine whether an item should be assigned to a particular cluster (col. 7, lines 5-22). With regard to weighting the centers by the number of points assigned to the center, as shown in claims 1, 15, 21 and 22, Leung et al. teach determining the overall distance to determine a measure of goodness for clusters (col. 7, lines 23-37). With regard to clustering weighted centers together to find final centers using a specific error metric and clustering method, as shown in claims 1, 7, 15, 21 and 22, Leung et al. teach combining clusters for a number of iterations (col. 7, line 38 – col. 4, line 14). With regard to a main memory and a processor, as shown in claims 21 and 22, Leung et al. teach a computer-implemented method (col. 4, lines 53-63). A computer inherently contains memory. Leung et al. do not teach partitioning a set into disjoint pieces or plural processors, as shown in claims 1, 15, 21 and 22.

Fayyad et al. teach deciding partitions on a set of points (col. 6, lines 47-57). Fayyad et al. further teach using more than one processing unit (col. 4, lines 15-24). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the clustering method, as taught by Leung et al., to include partitioning and using more than one

processor, as taught by Fayyad et al. because then the clustering technique would have been useful to a wide array of applications (Fayyad et al., col. 2, lines 47-56; col. 1, lines 5-24).

With regard to performing clustering upon obtaining iteratively obtained weighted intermediate clusters, as shown in claim 5, and replacing S with weighted intermediate centers from the previous iteration, as shown in claim 6, Leung et al. teach an iteration method for obtaining a cluster and assigning items to cluster with the highest similarity measure (col. 7, lines 1-13; Figs. 1A and 1B, steps 106, 111 and 112). With regard to repeating the partitioning, determining, assigning and weighting for a second set of data points, and clustering the second set of points, as shown in claims 13 and 19, Leung et al. teach using an iteration variable to iteratively perform a cluster method on more than one set of points (col. 6, line 59 – col. 7, line 13; Figs. 1A and 1B).

Leung et al. do not teach having each partitioned piece small enough to fit into the memory to be used for processing the piece, as shown in claims 3 and 17. Fayyad et al. teach having a memory able to handle small samples and running the algorithm on a RAM buffer (col. 8, line 64 – col. 9, line 14). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the clustering method, as taught by Leung et al., to include a memory capable of handling a piece of a set of data, as taught by Leung et al. and Fayyad et al., to include summing the squares of the distances between pairs, because then the clustering method would have performed well for cases where the objects of the clusters form naturally distinct groups (Fahy, page 6, par. 59).

Official Action, pages 3-5.

The Applicant respectfully traverses the rejection. The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but

also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

In the present case the combination of Leung and Fayyad cannot render the Applicant's claims obvious under Section 103 because that combination does not include all of the elements recited in the Applicant's claims. For example, independent claims 1 and 15 recite "partitioning said set S into P disjoint pieces S_1, \dots, S_P " and "clustering performed using a specific error metric and a clustering method A." Similarly, independent claims 21 and 22 recite *a processor* "configured to partition said set S into P disjoint pieces S_1, \dots, S_P such that each piece S_i fits in main memory" and "clustering performed using a specific error metric and a clustering method A." Thus, the Applicant's independent claims are directed to partitioning the set into disjoint pieces and clustering using a specific error metric and a clustering method A. Furthermore, the Examiner's rationale for combining the references appears to be based on potential advantages hypothesized by the Examiner, not on the

references themselves. Accordingly, the Applicant respectfully submits that Leung and Fayyad, alone or in combination, fail to render the claims obvious, as discussed below.

Neither the teachings of the Leung and Fayyad references disclose the claimed subject matter of independent claims 1, 15, 21 and 22. The Examiner admitted that the Leung reference does not teach partitioning a set into disjoint pieces or a plurality of processors. In an attempt to cure these deficiencies, the Examiner relied upon the Fayyad reference to augment the teachings of Leung. Specifically, the Examiner asserted that the Fayyad reference teaches deciding partitions on a set of points and using more than one processing unit. However, the Leung and Fayyad references, either alone or in combination, do not disclose or suggest partitioning a set into P disjoint pieces or clustering performed using a specific error metric, as recited in independent claims 1, 15, 21 and 22.

In the Leung reference, a data set is provided along with cluster center seeds, which are user inputs for clustering centers. *See* Leung, col. 7, lines 5-12. Each item in the data set is scored against the cluster centers to determine a similarity measure that is used to assign the item to a cluster center. *See id.* at col. 7, lines 14-20. These cluster centers are updated and re-evaluated to provide a measure of the goodness for each of the iterations. *See id.* at col. 7, lines 30-37. Once the iterations have exceeded a defined maximum value, the process ends. *See id.* at col. 8, lines 10-15. Then, the iteration with the lowest overall distance is picked as the best cluster. *See id.* Clearly, the Leung reference fails to disclose or suggest the partitioning the data set into disjoint pieces or even clustering performed using a specific error metric and a clustering method A, as recited in claims 1, 15, 21 and 22.

Fayyad fails to cure the deficiencies of Leung. The Fayyad reference relates to a method of adjusting an initial starting point to a point that is likely to be nearer to modes of the data distribution. *See* Fayyad, col. 3, lines 17-23. The refinement component 72 is utilized by the technique to address problems with noisy estimates by obtaining multiple subsamples 103 that are clustered separately. *See id.* at col. 6, lines 38-44. This is done to produce J solutions, which are viewed as J candidate starting initial points. *See id.* at col. 6, lines 38-44. The production of the optimal solution from the J solutions is described in Fayyad, as follows:

As illustrated in the FIG. 2 flowchart, these multiple solutions are then used to produce an optimum solution. One possible use of the multiple solutions would be take the superposition of the solution (e.g. the mean of the centroids obtained for each cluster) to reduce the J candidate starting points for a cluster to one candidate point. However, to perform this superposition or averaging, one needs to first solve a correspondence problem: decide a partition on the J solutions (recall each of the J solutions consists of K points) such that the J points in each block of the K-partition belong together. This is illustrated in FIG. 6.

Fayyad, col. 6, lines 47-57.

As described in the passage, each of the solutions is grouped together in trials. These trials are utilized to provide cluster centroids. *See id.* at col. 6, lines 58-62. The passage does not disclose or even suggest partitioning the data set into disjoint pieces. Further, Fayyad does not even disclose or suggest clustering performed using a specific error metric and a clustering method A, as recited in claims 1, 15, 21 and 22. Thus, Fayyad does not disclose the claimed subject matter and fails to cure the deficiencies of Leung.

Furthermore, the Examiner's rationale for combining the references appears to be based on potential advantages hypothesized by the Examiner, not on the teachings in

references themselves. In the rejection, the Examiner asserted that the combination is obvious because the clustering technique would have been useful in a wide variety of applications. However, this statement is a vague statement that does not provide support or a rationale for the proposed combination. Indeed, in the combination, the Examiner has not provided any evidence of suggestion by the prior art references that the proposed advantages would be expected from this combination. Accordingly, because no teaching or suggestion supporting the combination is present, the Examiner's proposed combination is not proper.

For at least these reasons, Leung and Fayyad clearly do not contain each and every element set forth in the independent claims 1, 15, 21 and 22, or the claims depending therefrom. Further, the Examiner's rationale for combining the references appears to be based on potential advantages hypothesized by the Examiner, not on the teachings in references themselves. Thus, no combination of these references can render the Applicant's claims obvious. Accordingly, the Applicant requests withdrawal of the rejection under Section 103 and allowance of the rejected claims.

Second Rejection Under 35 U.S.C. § 103

The Examiner rejected claims 8 and 11 under 35 U.S.C. § 103(a) as being unpatentable over Leung in view of Fayyad and Fahy. The Applicant respectfully traverses this rejection.

Claims 8 and 11 depend from independent claim 1 that is clearly patentable over Leung and Fayyad, as discussed above. To reject this claim, the Examiner asserted that Leung and Fayyad disclosed all of the claimed subject matter except minimizing the sum of

the squares of the distance s between points and their nearest centers. In an attempt to remedy this deficiency, the Examiner relied on Fahy. The Fahy reference is directed to cluster analysis in biological data that includes gene array data. *See* Fahy, page 1, paragraph 0001. Specifically, the Fahy method improves hierarchical clustering techniques of large test matrices. *See id.* at page 4, paragraph 0032. However, Fahy fails to disclose or suggest partitioning the data set into disjoint pieces and clustering performed using a specific error metric and a clustering method A. As such, Fahy fails to cure the deficiencies of the Leung and Fayyad. Accordingly, in view of the remarks set forth above, the Applicant respectfully submits that Fahy along with Leung and Fayyad does not render the claimed subject matter obvious.

Because the Examiner failed to show the cited reference discloses all of the claimed subject matter, the Examiner has failed to establish a *prima facie* case of obviousness. Therefore, the Applicant respectfully requests withdrawal of the rejection and allowance of claims 8 and 11.

Third Rejection Under 35 U.S.C. § 103

The Examiner rejected claims 9, 10 and 12 under 35 U.S.C. § 103(a) as being unpatentable over Leung in view of Fayyad and Tuzhilin. The Applicant respectfully traverses this rejection.

Claims 9, 10 and 12 depend from independent claim 1 that are clearly patentable over Leung and Fayyad, as discussed above. To reject these claims, the Examiner asserted that Leung and Fayyad disclose all the recited features except minimizing the sum of the squares of the distances or an approximation-based method. In an attempt to remedy these

deficiencies, the Examiner relied on Tuzhilin. The Tuzhilin reference relates to a system and method for dynamic profiling of a user in one-to-one marketing applications. *See* Tuzhilin, col. 1, lines 7-10. However, the Tuzhilin reference fails to disclose or suggest partitioning the data set into disjoint pieces and clustering performed using a specific error metric and a clustering method A. As such, Tuzhilin fails to cure the deficiencies of the Leung and Fayyad. Accordingly, in view of the remarks set forth above, the Applicant respectfully submits that Tuzhilin along with Leung and Fayyad does not render the claimed subject matter obvious.

Because the Examiner has failed to show that the cited reference discloses all of the claimed subject matter, the Examiner has failed to establish a *prima facie* case of obviousness. Therefore, the Applicant respectfully requests withdrawal of the rejection and allowance of claims 9, 10 and 12.

Fourth Rejection Under 35 U.S.C. § 103

The Examiner rejected claims 14 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Leung in view of Fayyad and Martin. The Applicant respectfully traverses this rejection.

Claim 14 depends from independent claim 1 and claim 20 depends from independent claim 15, which are both clearly patentable over Leung and Fayyad, as discussed above. To reject these claims, the Examiner asserted that Leung and Fayyad disclose all the recited features except performing the partitioning, assigning, and weighting in parallel for each piece. In an attempt to remedy these deficiencies, the Examiner relied on Martin. The Martin reference relates to a method and system for enhancing efficiency of Online Analytical

Processing (OLAP) and Data Warehouse applications. *See* Martin, col. 1, lines 7-10.

However, the Martin reference fails to disclose or suggest claimed subject matter discussed above. As such, Martin fails to cure the deficiencies of the Leung and Fayyad. Accordingly, in view of the remarks set forth above, the Applicant respectfully submits that Martin along with Leung and Fayyad does not render the claimed subject matter obvious.

Because the Examiner has failed to show that the cited reference discloses all of the claimed subject matter, the Examiner has failed to establish a *prima facie* case of obviousness. Therefore, the Applicant respectfully requests withdrawal of the rejection and allowance of claims 14 and 20.

Conclusion

In view of the amendments and remarks set forth above, the Applicant respectfully requests the Examiner to withdraw all rejections of the Applicant's pending claims 1-3, 5-17 and 19-22. Furthermore, the Applicant asserts that an indication of the allowability of claims 1-3, 5-17 and 19-22 is appropriate. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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